REMARKS

Claims 1 - 19 are pending in the application. No claim amendments are proposed. Rather, reconsideration of the application is requested in view of the remarks set forth below.

Referring to the Office Action, the rejections are addressed in combination for the sake of brevity.

Claims 1 – 5, 8 – 10, 12, 15, and 19 have been rejected under 35 USC §103 over Ederer et al. (WO 01/26885 A1) in view of Hiraoka et al. (US Patent 5,589,554).

Claims 6 – 7, 11, 13 – 14, and 16 - 18 have been rejected under 35 USC 103 over Ederer et al. (WO 01/26885 A1) and Hiraoka et al. (US Patent 5,589,554), and further in view of Bredt (WO 01/34371).

Applicant respectfully traverses each of the rejections. Even in combination, the cited references fail to teach or suggest the present invention in any manner sufficient to sustain the rejections.

The present invention provides suitable low-viscosity building materials and bath compositions for the production of three-dimensional models or elements. The present claims recite a combination of at least one building material and a bath fluid for a method for directly printing elements and models.

The Examiner asserts that Ederer "discloses a combination of a building material and a bath fluid (supporting fluid) for a method for directly printing components and models, the building material being a liquid resin that is solidified by reaction with a reaction agent contained in the bath fluid." (Office

Action, p.3). The Examiner argues that Ederer discloses a "method substantially identical to the method for directly printing visual-aid models or elements, described in the specification...(and) the term 'liquid resin' implies the term 'a low viscosity monomeric or oligomeric compound' used in claim 1." (Office Action, p.3).

The Examiner expressly acknowledges that Ederer "does not disclose that the building material contains a cyanoacrylate, a mixture of cyanoacrylates or a mixture of one or more cyanoacrylates with additionally anionically polymerizable compounds, etc." (Office Action, p.3).

The Examiner points to page 11, lines 20-33 of Ederer, and argues that the bath liquid consists of an aqueous solution:

> When using a glycerine solution, an aqueous solution may be selected containing glycerine in an amount of 85 percent by weight and propyleneglycol 1.2-propandiole or polysorbate as additives.

Hence, Ederer teaches to preferably use a glycerine solution (see e.g. page 11, line 14) as supporting liquid, or to use an 85 percent by weight aqueous glycerine solution. One of skill in the art would not consider an 85 percent by weight aqueous glycerine solution to be an aqueous solution, i.e. a solution, by definition, the major part of which being water as a solvent. Rather, Ederer teaches using a solution having a rather high viscosity, such as a glycerine solution, in order to be suitably used as a support for the building material. Additionally, Ederer does not disclose a *basic* aqueous solution.

A glycerine solution does not fulfill the requirements for a suitable bath fluid as outlined, for example, on page 4, lines 2 to 5 of the present application, according to which the disposal of the bath fluid by way of the regular

canalization is possible without further action. Applicant notes that a glycerine solution or an 85 percent by weight aqueous glycerine solution does not fulfill this requirement. Finally, with respect to the bath fluid, Ederer does not disclose using an initiator to initiate the polymerization reaction of the low-viscosity monomeric or oligomeric compounds contained in the building material.

Hiraoka cannot remedy the deficiencies of Ederer. Even in combination with Ederer, there is neither teaching nor suggestion of a combination of a building material and a bath fluid (supporting fluid) for a method for directly printing components and models as recited in the present claims.

The Examiner relies on Hiraoka for disclosure of an adhesive composition which comprises a 2-cyanoacrylate and at least one of compounds (a) and (b): (a) an addition reaction product of an epoxy group and a compound having a cyano group and a carboxylic acid group in its molecule, and (b) a compound having a cyano group and a carboxylic acid group in its molecule; cf. abstract.

Hiraoka indicates at column 2, lines 45 to 50, surface hardening properties, quick-hardening properties and thick-film hardening properties of the adhesive composition can be improved by adding a cyanoacetic acid epoxy adduct [i.e. compound (a)] or a cyano-containing carboxylic acid [i.e. compound (b)] to the 2-cyanoacrylate.

Hence, it is the object of Hiraoka's invention to improve various properties of the adhesive composition by adding a cyanoacetic acid epoxy adduct or a cyano-containing carboxylic acid to the 2-cyanoacrylate. Thus, Hiraoka's invention relates to a completely different technical field, i.e. 2-cyanoacrylate-based adhesive compositions.

Moreover, there is no suggestion in Hiraoka that the adhesive compositions disclosed therein would be suitable for use in the method of Ederer. Indeed, Applicant

respectfully submits that one skilled in the art would not even look to Hiraoka in order to solve the object underlying the present invention. It is respectfully submitted that one skilled in the art at the time the invention was made would not have considered cyanoacrylates as suitable building materials in combination with an aqueous bath fluid.

It also is noted that the present claims do not recite cyanoacrylate-based adhesive compositions. Rather, present claim 1 is directed to a combination of at least one building material and an aqueous bath fluid for a method for directly printing elements and models as further specified in the claim. Such a combination is clearly not disclosed or suggested by Hiraoka, even in combination with Ederer.

For instance, one skilled in the art would not have combined the teaching of Ederer with that of Hiraoka since he would not have expected that a cyanoacrylate-based adhesive composition could be used in a method for directly printing elements and models, i.e. in a method in which the adhesive composition would have to be applied by use of a printer. In view of the extremely high reactivity of cyanoacrylate-based adhesive compositions, one skilled in the art would not have been motivated to use such adhesive compositions in a method for directly printing. Rather, the skilled artisan would reasonably have expected that use of such an adhesive composition would immediately result in clogging of the print head.

Moreover, one skilled in the art would not have considered it to be possible to make use of a 2-cyanoacrylate-based adhesive composition in combination with an aqueous solution in a method for directly printing elements and models. See, e.g., our response filed on October 16, 2006, at pages 9 to 12. In particular, in the first paragraph of page 11 in our submission on October 16, 2006, it is noted that water is a chain-transfer agent and terminates typical anionic polymerizations (such as that of cyanoacrylates), since the carbanion as the end-group of the propagating polymer chain reacts with a proton of the water by formation of a OH^- ion and the carbanion is transferred in a non-reactive end-

group. Accordingly, growth of the polymer chain is stopped. Since the OH^- ion is not sufficiently nucleophilic to reinitiate polymerization not only the real chain is broken, however, also the kinetic chain. Thus, the polymerization is stopped in total if water is present as an impurity.

Reference also is made in particular to item c), at pages 11-12 of our response on October 16, 2006. Thus, in the presence of larger amounts of water, no polymer can be formed in a typical anionic polymerization reaction. Therefore, one skilled in the art would not have been motivated to try 2-cyanoacrylate-based adhesive compositions as disclosed by Hiraoka with a reasonable expectation of success in the combination recited in claim 1 of the present invention.

Indeed, the cited art teaches away from the present invention, further rebutting any case of *prima facie* obviousness which may be contended. The findings of the present inventors are contrary to conventional knowledge and they surprisingly discovered that it was possible, according to the present invention, to obtain a solid material by polymerization of a building material being dropped into a bath fluid consisting of an aqueous solution containing an initiator.

Finally, even assuming for argument's sake that one skilled in the art might have taken Hiraoka into consideration, he still would not have arrived at the claimed subject-matter in any obvious manner. For instance, the experimental results obtained with respect to storage stability, hardening properties of thick films, whitening degree, hardening time and surface hardening properties are very poor for the composition of Comparative Example 2 (see Hiraoka at column 7, lines 7 to 11). According to Comparative Example 2, a suitable amount of an epoxy resin which was used in Examples 1 to 3 was added to Three Bond 1741, followed by stirring. Three Bond 1741 is a commercially available 2-cyanoacrylate-based adhesive containing 0.1% of hydroquinone and a trace amount of boron trifluoride (see column 6, lines 20 to 23 of Hiraoka).

The definition of the building material according to claim 1 of the present invention clearly differs from the composition of the 2-cyanoacrylate-based adhesive composition disclosed by Hiraoka in that according to the present invention no addition reaction product of an epoxy group and a group having a cyano group and a carboxylic acid group in its molecule (compound (a)) or a compound having a cyano group and a carboxylic acid group in its molecule (compound (b)) are present in the building material as defined in claim 1 of the present invention. Hence, the building material recited in present claim 1 does not include the essential components of the adhesive composition described by Hiraoka.

With reference to claim 4 of the present invention in which the additional anionically polymerizable compound is defined to be an epoxide, it is noted that a composition containing 2-cyanoacrylate and an epoxy resin is disclosed as Comparative Example 2 by Hiraoka. The characteristics of that composition are very poor. Therefore, one skilled in the art would not have selected the composition of Comparative Example 2 rather than any other composition of the Examples disclosed by Hiraoka as a building material in the combination of claim 1 of the present invention.

Likewise, Table 4 in columns 8 and 9 of Hiraoka shows a very long surface hardening time, a very poor surface hardening state ("X": lusterless opaque nonuniform; see column 9, line 28), a very bad storage stability at 70°C and a low adhesive strength.

Hence, there would be no motivation for one skilled in the art to omit compounds (a) and (b) of the adhesive composition disclosed by Hiraoka and to use this composition as a building material in the combination of the present invention.

Bredt adds little to the teachings of Ederer and Hiraoka and is insufficient to sustain the latter of the two rejections. Even in combination, there is no teaching or suggestion of the combination of at least one building material and a bath fluid as defined in claim 1 of the present invention.

Indeed, the method disclosed by Bredt et al. is quite distinct from the method of Ederer and, moreover, does not disclose the building material as recited in claim 1 of the present invention.

Bredt claims a method of three-dimensional printing, comprising: providing a first layer of dry particulate material comprising an ionic reactant; dispensing a homogenous fluid onto a first region of the first layer, the fluid comprising an ionic reactant; and allowing an ion exchange reaction to occur between the particulate reactant and the reactant in the fluid, the reaction causing a solidified material to form in the first region.

According to other features of Bredt's invention, the reactant in the fluid is an electrolyte, cationic electrolyte or anionic polyelectrolyte, respectively. Furthermore, the particulate ionic reactant is a cationic reactant or an anionic reactant, respectively. According to other methods disclosed, a fluid is dispensed on a dry particulate material.

Given the deficiencies of Ederer and Hiraoka, Bredt is clearly insufficient to sustain the rejection.

The cited documents, even in combination, do not teach or suggest a combination of a building material and a bath fluid (supporting fluid) for a method for directly printing components and models as recited in the present claims.

For at least the foregoing reasons, the §103 rejection should be withdrawn. To establish a *prima facie* case of obviousness, three basic criteria must be met: (1) there

must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference(s) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143.

In the present case, there is no suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the cited references to arrive at the presently-claimed invention, nor is there any reasonable expectation of success. A *prima facie* case of obviousness therefore cannot be established, and the rejection must be withdrawn.

In view of the above amendments and remarks, Applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

By _____

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